TITLE OF THE INVENTION

INFORMATION PROCESSING APPARATUS AND METHOD

FIELD OF THE INVENTION

5   The present invention relates to an information
processing apparatus and method suitable for a system
for converting text inserted in a web page into speech,
and providing that speech to the user.

10   BACKGROUND OF THE INVENTION

In recent years, text-to-speech synthesis
techniques have been used in various technical fields.
Recently, a text-to-speech synthesis system that
converts text inserted in a web page into speech, and

15   provides that speech to the user has been proposed.

However, since most of recently proposed
text-to-speech synthesis systems convert text inserted
in a web page into speech from the beginning to the end,
if the text size is large, the load on the user becomes

20   heavy.

In a recent text-to-speech synthesis system, the
user cannot determine the latest information inserted
in a web page or misses information he or she wants to
know unless he or she sets his or her mind to listening

25   to the speech from the beginning to the end, resulting
in inconvenience.

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SUMMARY OF THE INVENTION

An object of the present invention is to solve the above-described problem.

To achieve the above object, an information processing apparatus according to one preferred embodiment of the present invention comprises detection means for detecting new text inserted in a web page, and transmission means for transmitting a character string that represents the text to a client which registered the web page.

An information processing method according to another embodiment of the present invention comprises a detection step of detecting new text inserted in a web page, and a transmission step of transmitting a character string that represents the text to a client which registered the web page.

An information processing method according to still another embodiment of the present invention comprises detection means for detecting new text inserted in a web page, conversion means for converting a character string that represents the text into a phonetic character string, and transmission means for transmitting the phonetic character string to a client which registered the web page.

An information processing method according to still another embodiment of the present invention comprises a detection step of detecting new text

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inserted in a web page, a conversion step of converting
a character string that represents the text into a
phonetic character string, and a transmission step of
transmitting the phonetic character string to a client
5   which registered the web page.

An information processing method according to
still another embodiment of the present invention
comprises detection means for detecting new text
inserted in a web page, conversion means for converting
10   a character string that represents the text into
synthetic speech, and transmission means for
transmitting the synthetic speech to a client which
registered the web page.

An information processing method according to
15   still another embodiment of the present invention
comprises a detection step of detecting new text
inserted in a web page a conversion step of converting
a character string that represents the text into
synthetic speech, and a transmission step of
20   transmitting the synthetic speech to a client which
registered the web page.

An information processing method according to
still another embodiment of the present invention
comprises reception means for receiving a character
25   string that represents new text inserted in a web page,
conversion means for converting the character string

that represents the text into synthetic speech, and speech output means for outputting the synthetic speech.

An information processing method according to still another embodiment of the present invention

5   comprises a reception step of receiving a character string that represents new text inserted in a web page, a conversion step of converting the character string that represents the text into synthetic speech, and a speech output step of outputting the synthetic speech.

10 An information processing method according to still another embodiment of the present invention comprises reception means for receiving a phonetic character string that represents new text inserted in a web page, conversion means for converting the phonetic

15 character string that represents the text into synthetic speech, and speech output means for outputting the synthetic speech.

An information processing method according to still another embodiment of the present invention

20 comprises a reception step of receiving a phonetic character string that represents new text inserted in a web page, a conversion step of converting the phonetic character string that represents the text into synthetic speech, and a speech output step of

25 outputting the synthetic speech.

An information processing method according to still another embodiment of the present invention

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comprises reception means for receiving synthetic
speech that represents new text inserted in a web page,
and speech output means for outputting the synthetic
speech.

5   An information processing method according to
still another embodiment of the present invention
comprises a reception step of receiving synthetic
speech that represents new text inserted in a web page,
and a speech output step of outputting the synthetic
10   speech.

Still other objects of the present invention, and
the advantages thereof, will become fully apparent from
the following detailed description of the embodiments.

15   BRIEF DESCRIPTION OF THE DRAWINGS
Fig. 1 is a block diagram showing an example of a
client-server information delivery system according to
an embodiment of the present invention;
Fig. 2 is a block diagram showing the arrangement
20   of principal part of a server 10 in the embodiment of
the present invention;
Fig. 3 is a view for explaining user information
file managed by the server 10;
Fig. 4 is a view for explaining contents
25   information file managed by the server 10;
Fig. 5 is a view for explaining new information
file managed by the server 10;

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Fig. 6 is a flow chart for explaining the sequence for generating new information file in the embodiment of the present invention;

Fig. 7 is a flow chart for explaining details of the sequence for generating new information file in the embodiment of the present invention;

Fig. 8 is a flow chart for explaining the sequence for delivering delivery information in the embodiment of the present invention;

Fig. 9 is a block diagram showing the arrangement of principal part of a client 20 in the embodiment of the present invention;

Fig. 10 is a flow chart for explaining a principal processing sequence of the client 20 in the embodiment of the present invention;

Fig. 11 is a block diagram showing the arrangement of principal part of a client 21 in the embodiment of the present invention;

Fig. 12 is flow chart for explaining a principal processing sequence of the client 21 in the embodiment of the present invention;

Fig. 13 is a block diagram showing the arrangement of principal part of a client 22 in the embodiment of the present invention;

Fig. 14 is flow chart for explaining a principal processing sequence of the client 22 in the embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The preferred embodiments of the present invention will now be described in detail hereinafter with reference to the accompanying drawings.

An example of a client-server information delivery system according to this embodiment will be described below with reference to Fig. 1.

Referring to Fig. 1, reference numeral 10 denotes a server. The server 10 detects new text inserted in a web page (to be referred to as new information hereinafter), and delivers it to clients. Reference numerals 20, 21, and 22 denote clients. The clients 20, 21, and 22 receive new information delivered from the server 10, and outputs synthetic speech that represents the new information. Reference numeral 30 denotes the Internet.

The arrangement of principal part of the server 10 of this embodiment will be described below using Fig. 2.

Referring to Fig. 2, reference numeral 201 denotes a user information database. The user information database 201 manages user information files to be described later. Reference numeral 202 denotes a contents information database. The contents information database 202 manages contents information files to be described later. Reference numeral 203

denotes a new information database. The new
information database 203 manages new information files
to be described later. Reference numeral 204 denotes a
new information generator for generating new

5   information files and contents information files.
Reference numeral 205 denotes a language analyzer for
converting a character string into a phonetic character
string. Note that the language analyzer 205 may be
implemented by either hardware or software. Reference

10 numeral 206 denotes a speech synthesizer for converting
a phonetic character string into synthetic speech.
Note that the speech synthesizer 206 may be implemented
by either hardware or software. Reference numeral 207
denotes a communication unit which can communicate with

15 the clients 20, 21, and 22. Reference numeral 208
denotes a delivery information generator for generating
delivery information.

    Items to be managed by a user information file in
this embodiment will be explained below with reference

20 to Fig. 3. In this embodiment, one user information
file manages at least seven items as follows.

    (1) User name
    This item manages the user name of the client.
    (2) Password

25 This item manages a password registered by the
client.
    (3) Mode information

This item manages mode information for designating a data format of delivery information to be delivered to the client. If mode information = "1", the data format of the delivery information is synthetic speech. If mode information = "2", the data format of delivery information is a phonetic character string. If mode information = "3", the data format of delivery information is a character string.

(4)   URL

This item manages a character string that represents the URL of a web page.

(5)   Pronunciation of title

This item manages a character string which represents a pronunciation of the title of a web page.

(6)   Unnecessary character string

This item manages a character string which is not to be output as speech (to be referred to as an unnecessary character string hereinafter). One or more unnecessary character strings can be set per URL.

(7)   Word and pronunciation of word

This item manages a word to be pronounce as another (e.g., a new word, abbreviation) and a character string that represents a pronunciation of that word. One or more words and their pronunciations can be set per URL.

Items to be managed by a contents information file in this embodiment will be explained below with

reference to Fig. 4. In this embodiment, one contents
information file manages at least two items as follows.

(1) URL

This item manages a character string which
5   represents the URL of a web page.

(2) Contents

This item stores the latest contents (latest HTML
file) of a web page.

Items to be managed by a new information file in
10 this embodiment will be explained below with reference
to Fig. 5. In this embodiment, one new information
file manages at least five items as follows.

(1) URL

This item manages a character string that
15 represents the URL of a web page.

(2) Title

This item manages a character string that
represents the title of a web page.

(3) Creation date of new information
20   This item manages a character string which
represents year, month, day, and time of creation of
new information.

(4) New information

This item manages new text inserted in a web page
25 (i.e., new information).

(5) Abstract information

This item manages a character string that represents an abstract of a web page corresponding to a new link inserted in a web page (to be referred to as abstract information hereinafter). Note that the abstract information is generated in accordance with a predetermined abstract generation program (e.g., a scheme for selecting a sentence including a predetermined keyword).

One of principal processing sequences of the server 10 in this embodiment will be explained below with reference to Fig. 6. Fig. 6 explains the sequence for generating new information files and contents information files in units of URLs registered in each user information file. Note that the server 10 of this embodiment automatically executes the sequence shown in Fig. 6 at a given time interval.

In step S601, the new information generator 204 selects one of user information files stored in the user information database 201.

In step S602, the new information generator 204 selects one of URLs registered in the user information file selected in step S601.

The new information generator 204 checks in step S603 if an HTML file corresponding to the URL selected in step S602 has been updated (i.e., a web page has been updated). If YES in step S603, the flow advances to step S604; otherwise, the flow advances to step S606.

In step S604, the new information generator 204 generates a new information file of the URL selected in step S602, and stores it in the new information database 203.

5   In step S605, the new information generator 204 generates a contents information file that contains the URL selected in step S602, and the latest HTML file acquired in step S602, and stores it in the contents information database 202.

10   The new information generator 204 checks in step S606 if the user information file selected in step S601 includes URL to be processed. If YES in step S606, the flow returns to step S602; otherwise, the flow advances to step S607.

15   The new information generator 204 checks in step S607 if the user information database 201 includes user information files to be processed. If YES in step S607, the flow returns to step S601; otherwise, this flow ends.

20   The process in step S604 in Fig. 6 (i.e., the process for generating a new information file) will be described in detail below with reference to Fig. 7.

In step S701, the new information generator 204 detects new text (i.e., new information) and a link

25   inserted in a web page. For example, the new information generator 204 detects the new information and link by comparing the latest HTML file acquired in

step S602, and an old HTML file acquired from the contents information file. Furthermore, the new information generator 204 detects the title of the web page and the creation date of the new information.

5   The new information generator 204 checks in step S702 if a link is detected in step S701. If at least one link is detected, the flow advances to step S703; otherwise, the flow jumps to step S704.

In step S703, the new information generator 204
10   acquires an HTML file corresponding to each link, and abstracts text described in the acquired HTML file, thus generating abstract information of each link.

In step S704, the new information generator 204 generates a new information file that contains the
15   title, the creation date of the new information, the new information, and the abstract of each link, and stores it in the new information database 203.

Another principal processing sequence of the server 10 of this embodiment will be described below
20   with reference to Fig. 8. Fig. 8 will explain a sequence for generating delivery information, and delivering that information to the clients.

In step S801, the delivery information generator 208 selects one of user information files stored in the
25   user information database 201.

In step S802, the delivery information generator 208 detects mode information registered in the selected

user information file, and discriminates its contents.
If mode information = "1", the flow advances to step
S803; if mode information = "2", the flow advances to
step S804; or if mode information = "3", the flow
5 advances to step S805.

In step S803, the delivery information generator
208 selects one of URLs registered in the selected user
information file, and reads out a new information file
corresponding to the selected URL from the new
10 information database 203.

In step S804, the delivery information generator
208 deletes unnecessary character strings registered in
the user information file from the new information. In
the system of this embodiment with this arrangement,
15 character strings the user does not want are inhibited
from being spoken. The delivery information generator
208 substitutes a character string that represents the
title by that which represents a pronunciation of the
title registered in the user information file. In the
20 system of this embodiment with this arrangement, the
title of the web page can be spoken in a pronunciation
the user wants. Furthermore, the delivery information
generator 208 searches the new information for words
registered in the user information file, and
25 substitutes the found words by character strings which
represent pronunciations of words registered in the
user information file. In the system of this

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embodiment with this arrangement, words the user wants
can be spoken in pronunciations of his or her choice.

In step S805, the language analyzer 205 converts
character strings which represent the title, the
5   creation date of the new information, the new
information, and the abstract information of each link
into phonetic character strings (character strings each
consisting of characters and symbols that represent
pronunciations, accents, pauses, and intonations of
10   words).

In step S806, the speech synthesizer 206 converts
the phonetic character strings that represent the title,
the creation date of the new information, the new
information, and the abstract information of each link
15   into synthetic speeches.

In step S807, the delivery information generator
208 generates delivery information which contains the
synthetic speech that represents the title, the
creation date of the new information, the new
20   information, and the abstract information of each link.
The communication unit 207 delivers the delivery
information generated by the delivery information
generator 208 to the client 20.

The delivery information generator 208 checks in
25   step S808 if the user information file includes URL to
be processed. If YES in step S808, the flow returns to
step S803; otherwise, the flow ends.

In step S809, the delivery information generator 208 selects one of URLs registered in the user information file, and reads out a corresponding new information file from the new information database 203.

In step S810, the delivery information generator 208 deletes unnecessary character strings registered in the user information file from the new information. In the system of this embodiment with this arrangement, character strings the user does not want are inhibited from being spoken. The delivery information generator 208 substitutes a character string that represents the title by that which represents a pronunciation of the title registered in the user information file. In the system of this embodiment with this arrangement, the title of the web page can be spoken in a pronunciation the user wants. Furthermore, the delivery information generator 208 searches the new information for words registered in the user information file, and substitutes the found words by character strings which represent pronunciations of words registered in the user information file. In the system of this embodiment with this arrangement, words the user wants can be spoken in pronunciations of his or her choice.

In step S811, the language analyzer 205 converts character strings which represent the title, the creation date of the new information, the new information, and the abstract information of each link

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into phonetic character strings (character strings each
consisting of characters and symbols that represent
pronunciations, accents, pauses, and intonations of
words).

5   In step S812, the delivery information generator
208 generates delivery information which contains the
phonetic character strings that represent the title,
the creation date of the new information, the new
information, and the abstract information of each link.

10   The communication unit 207 delivers the delivery
information generated by the delivery information
generator 208 to the client 21.

The delivery information generator 208 checks in
step S813 if the user information file includes URLs to

15   be processed. If YES in step S813, the flow returns to
step S809; otherwise, the flow ends.

In step S814, the delivery information generator
208 selects one of URLs registered in the user
information file, and reads out a corresponding new

20   information file from the new information database 203.

In step S815, the delivery information generator
208 deletes unnecessary character strings registered in
the user information file from the new information.

In step S816, the delivery information generator

25   208 generates delivery information containing character
strings that represent the title, the creation date of
the new information, the new information, and the

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abstract information of each link. The communication
unit 207 delivers the delivery information generated by
the delivery information generator 208 to the client 22.

 5   The delivery information generator 208 checks in
step S817 if the user information file includes URLs to
be processed. If YES in step S817, the flow returns to
step S814; otherwise, the flow ends.

       The arrangement of principal part of the client
10   20 in this embodiment will be described below with
reference to Fig. 9. Note that the client 20 can be
applied to an information processing apparatus such as
a portable telephone, PDA (Personal Digital Assistant),
computer, or the like.

       Referring to Fig. 9, reference numeral 901
15   denotes a communication unit which can communicate with
the server 10. Reference numeral 902 denotes a
controller which comprises a microcomputer and memory.
Reference numeral 903 denotes a storage unit which
comprises a storage medium such as a hard disk,
20   semiconductor memory, or the like. Reference numeral
904 denotes a display unit which comprises a liquid
crystal display. Reference numeral 905 denotes a
console which comprises a plurality of operation keys
and a microphone. Reference numeral 906 denotes a
25   speech output unit which comprises a speaker.

A principal processing sequence of the client 20 in this embodiment will be described below with reference to Fig. 10.

In step S1001, the communication unit 901 receives delivery information delivered from the server 10. The delivery information received by the communication unit 901 is stored in the storage unit 903.

In step S1002, the speech output unit 906 outputs predetermined sound or speech (to be referred to as notice sound hereinafter) N (N is an integer equal to or larger than 1) times, thus calling user's attention.

The controller 902 checks in step S1003 if a response to the notice sound is input before a predetermined period of time elapses from output of the notice sound. The response to the notice sound is input when the user speaks a predetermined word on the microphone of the console 905 or operates a predetermined operation key of the console 905. If no response to the notice sound is input within the predetermined period of time, the flow advances to step S1004. On the other hand, if a response to the notice sound is input within the predetermined period of time, the flow advances to step S1005. With this arrangement, the client 20 can prevent the user from missing the delivery information.

In step S1004, the controller 902 waits until a predetermined period of time (the time period the user set in the client 20 in advance) elapses. After an elapse of the predetermined period of time, the flow

5   returns to step S1003.

In step S1005, the speech output unit 906 reads out the delivery information from the storage unit 903, and sequentially outputs the synthetic speeches which represent the title, the creation date of the new

10   information, the new information, and the abstract information of each link. The user can easily find a web page that has been updated by listening to synthetic speech that represents the title. Also, the user can easily find new information inserted in the

15   web page by listening to synthetic speech that represents the new information. Furthermore, the user can easily find the contents of a new link inserted in the web page by listening to synthetic speech that represents the abstract information of each link.

20   The arrangement of principal part of the client 21 in this embodiment will be described below with reference to Fig. 11. Note that the client 21 can be applied to an information processing apparatus such as a portable telephone, PDA (Personal Digital Assistant),

25   computer, or the like.

Referring to Fig. 11, reference numeral 1101 denotes a communication unit which can communicate with

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the server 10. Reference numeral 1102 denotes a
controller which comprises a microcomputer and memory.
Reference numeral 1103 denotes a storage unit which
comprises a storage medium such as a hard disk,

5   semiconductor memory, or the like. Reference numeral
1104 denotes a display unit which comprises a liquid
crystal display. Reference numeral 1105 denotes a
console which comprises a plurality of operation keys
and a microphone. Reference numeral 1106 denotes a

10   speech synthesizer for converting a phonetic character
string into synthetic speech. Note that the speech
synthesizer 1106 may be implemented by either hardware
or software. Reference numeral 1107 denotes a speech
output unit which comprises a speaker.

15   A principal processing sequence of the client 21
in this embodiment will be described below with
reference to Fig. 12.

        In step S1201, the communication unit 1101
receives delivery information delivered from the server

20   10. The delivery information received by the
communication unit 1101 is stored in the storage unit
1103.

        In step S1202, the speech output unit 1106
outputs predetermined sound or speech (to be referred

25   to as notice sound hereinafter) N (N is an integer
equal to or larger than 1) times, thus calling user's
attention.

The controller 1102 checks in step S1203 if a
response to the notice sound is input before a
predetermined period of time elapses from output of the
notice sound. The response to the notice sound is
5   input when the user speaks a predetermined word on the
microphone of the console 1105 or operates a
predetermined operation key of the console 1105. If no
response to the notice sound is input within the
predetermined period of time, the flow advances to step
10   S1204. On the other hand, if a response to the notice
sound is input within the predetermined period of time,
the flow advances to step S1205. With this arrangement,
the client 21 can prevent the user from missing the
delivery information.

15   In step S1204, the controller 1102 waits until a
predetermined period of time (the time period the user
set in the client 21 in advance) elapses. After an
elapse of the predetermined period of time, the flow
returns to step S1203.

20   In step S1205, the speech synthesizer 1106 reads
out the delivery information from the storage unit 1103,
and converts the phonetic character strings which
represent the title, the creation date of the new
information, the new information, and the abstract of
25   the each link into synthetic speeches.

          In step S1206, the speech output unit 1107
sequentially outputs the synthetic speeches which

represent the title, the creation date of the new information, the new information, and the abstract information of each link. The user can easily find a web page that has been updated by listening to

5   synthetic speech that represents the title. Also, the user can easily find new information inserted in the web page by listening to synthetic speech that represents the new information. Furthermore, the user can easily find the contents of a new link inserted in

10   the web page by listening to synthetic speech that represents the abstract information of each link.

The arrangement of principal part of the client 22 in this embodiment will be described below with reference to Fig. 13. Note that the client 22 can be

15   applied to an information processing apparatus such as a portable telephone, PDA (Personal Digital Assistant), computer, or the like.

Referring to Fig. 13, reference numeral 1301 denotes a communication unit which can communicate with

20   the server 10. Reference numeral 1302 denotes a controller which comprises a microcomputer and memory. Reference numeral 1303 denotes a storage unit which comprises a storage medium such as a hard disk, semiconductor memory, or the like. Reference numeral

25   1304 denotes a display unit which comprises a liquid crystal display. Reference numeral 1305 denotes a console which comprises a plurality of operation keys

and a microphone. Reference numeral 1306 denotes a language analyzer for converting a character string into a phonetic character string. Note that the language analyzer 1306 may be implemented by either

5   hardware or software. Reference numeral 1307 denotes a speech synthesizer for converting a phonetic character string into synthetic speech. Note that the speech synthesizer 1307 may be implemented by either hardware or software. Reference numeral 1308 denotes a speech

10   output unit which comprises a speaker.

A principal processing sequence of the client 22 in this embodiment will be described below with reference to Fig. 14.

In step S1401, the communication unit 1301

15   receives delivery information delivered from the server 10. The delivery information received by the communication unit 1301 is stored in the storage unit 1303.

In step S1402, the speech output unit 1306

20   outputs predetermined sound or speech (to be referred to as notice sound hereinafter) N (N is an integer equal to or larger than 1) times, thus calling user's attention.

The controller 1302 checks in step S1403 if a

25   response to the notice sound is input before a predetermined period of time elapses from output of the notice sound. The response to the notice sound is

input when the user speaks a predetermined word on the microphone of the console 1305 or operates a predetermined operation key of the console 1305. If no response to the notice sound is input within the

5   predetermined period of time, the flow advances to step S1404. On the other hand, if a response to the notice sound is input within the predetermined period of time, the flow advances to step S1405. With this arrangement, the client 22 can prevent the user from missing the

10   delivery information.

      In step S1404, the controller 1302 waits until a predetermined period of time (the time period the user set in the client 21 in advance) elapses. After an elapse of the predetermined period of time, the flow

15   returns to step S1403.

      In step S1405, the language analyzer 1306 reads out the delivery information from the storage unit 1303, and converts character strings which represent the title, the creation date of the new information, the

20   new information, and the abstract of the each link into phonetic character strings.

      In step S1406, the speech synthesizer 1307 converts the phonetic character strings which represent the title, the creation date of the new information,

25   the new information, and the abstract of the each link into synthetic speeches.

In step S1407, the speech output unit 1308 sequentially outputs the synthetic speeches which represent the title, the creation date of the new information, the new information, and the abstract

5 information of each link. The user can easily find a web page that has been updated by listening to synthetic speech that represents the title. Also, the user can easily find new information inserted in the web page by listening to synthetic speech that

10 represents the new information. Furthermore, the user can easily find the contents of a new link inserted in the web page by listening to synthetic speech that represents the abstract information of each link.

As described above, according to this embodiment,

15 the client 20 can briefly inform the user of the latest information inserted in a desired web page by registering the URL of the desired web page in the server 10.

Also, according to this embodiment, since the

20 data format of new information to be delivered to the client 20 and the like can be changed in correspondence with the functions of the client 20 and the like, a system which can flexibly cope with clients having different functions can be built.

25 The invention may be embodied in other specific forms without departing from essential characteristics thereof.

Therefore, the above-mentioned embodiments are merely examples in all respects, and must not be construed to limit the invention.

The scope of the present invention is defined by
5   the scope of the appended claims, and is not limited at all by the specific descriptions of this specification. Furthermore, all the modifications and changes belonging to equivalents of the claims are considered to fall within the scope of the present invention.